Mix/Cast Contamination Control

Completion of this training is required for general access to controlled facilities within the Mix/Cast work center.

Next

Mix/Cast Contamination Control

You should have completed the Basic Contamination Control Awareness course before attempting this Work Center Specific Training.

This Mix/Cast Contamination Control is part of a series of training courses to qualify you for access to Mix/Cast facilities.

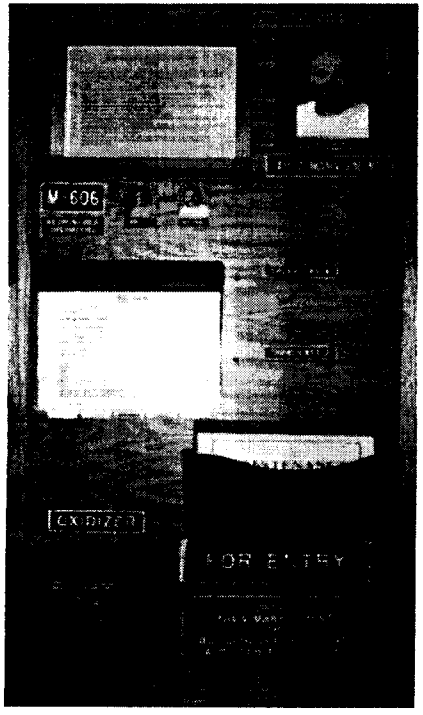
This course will:

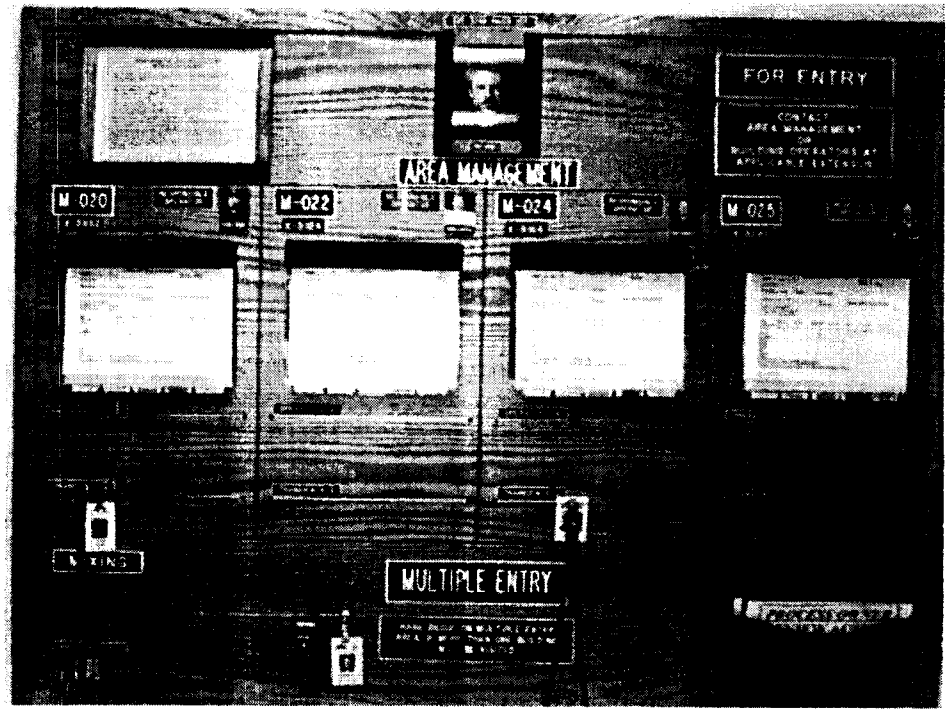
- List Contamination Control Requirements
- Identify foreign objects debris (FOD), Control Areas and their guidelines
- Describe environmental monitoring
- List Contamination Control Initiatives
- Describe concern for Controlled Materials
- Identify FOD Controlled Areas in Mix/Cast

Next

Check Points to Control FOD

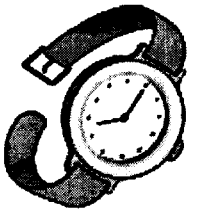
All facilities or processes where energetic materials are processed or stored require all personnel (visitors, transients and employees) to check-in/badge-in through an appropriate control area.

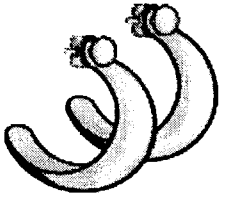




Next

Mix/Cast Empty Pockets/No Button Policy



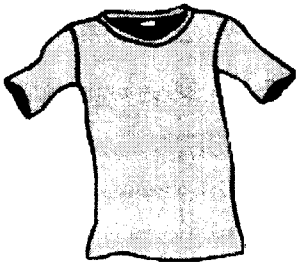


Empty Pockets

- Is the practice of emptying all clothing pockets of personal items and all personal accessories, such as earrings, watches, rings, wallets, exposed piercings, pens, coins, badges, pagers and cell phones.

No Buttons

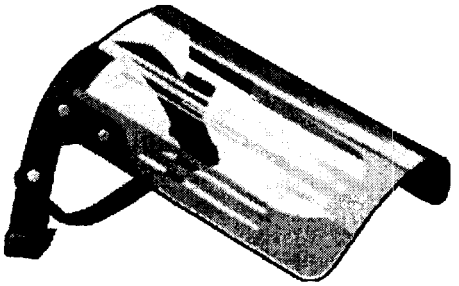
- Mix/Cast work center has a No Button shirt requirement to enter facilities M-120, M-314, M-27, M-309, M-320, M-174, M-13 & mixer buildings.

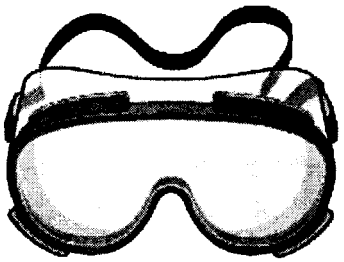


Next

Access Responsibilities

Area supervision and building personnel are responsible to ensure that all transient personnel follow all area PPE and FOD control requirements and are escorted as required.



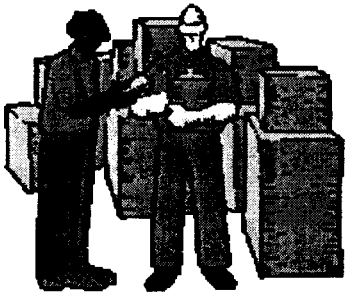


Next

Let's take a quiz.

Transients and visitors to Mix/Cast Controlled Areas must be?

(check all that apply)



- [x] Escorted by trained personnel
- [x] Must check-in/badge-in through control point
- [x] Must be aware of FOD restrictions
- [ ] Free to explore if appropriately attired

Submit Reset

Building Status

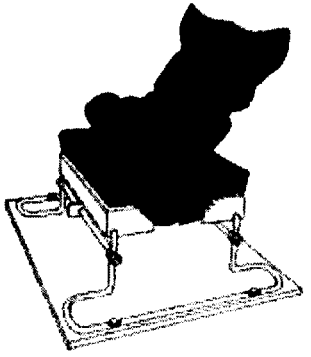
The designated status of an area or facility indicates whether control measures are in force or suspended.

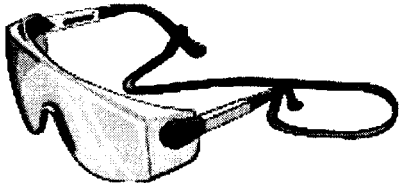
CONTROLLED STATUS:	OPEN STATUS:
All FOD, tool material and access control measures are in force.	FOD, tool, material, and/or access control measures have been suspended pending completion of maintenance, repair activities or for other reasons.

Next

FOD Control Zone Guidelines

- Entryways to the outside of a facility or areas outside a FOD control zone are to be controlled such that migratory FOD is not introduced into the process (e.g., tacky mats, shoe brushes, etc.).
- Glasses, including reading glasses, must be approved prescription safety glasses with tether and side shields.
- Clean all horizontal and overhead structures, including cranes, beams, platforms, etc. at least once per calendar year or as directed by Work Center Director.





Next

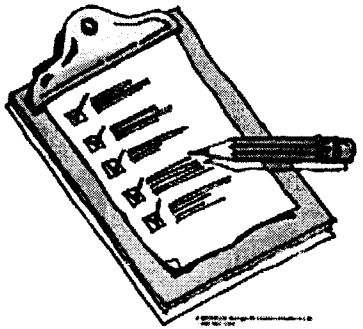
FOD Bags/Cans

FOD Bags/Cans are encouraged to be used in production areas as an effective tool for monitoring the FOD "health" of a facility or process. Any non-contaminated loose items discovered during floor walks or audits are placed in the bags. These bags are emptied and the contents reviewed/trended by the facility/process owners as a means of helping to identify systemic generators of FOD.

Next

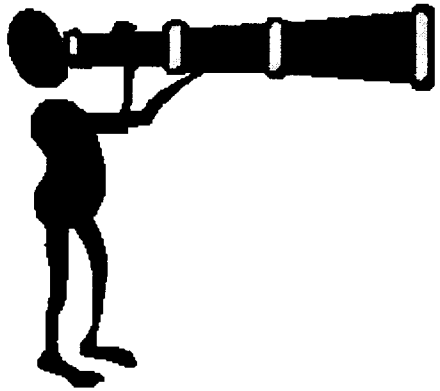
Loose Item Accountability During Controlled Status

- Area supervision must control all loose items, (tools, equipment) taken in and out of all FOD control zones. During maintenance activity, a Tool Checklist (FOP-0179) must be used and remain on file at the facility control/process check-in point for a least one month.
- Any other items taken into a FOD control zone (e.g., notebooks, pens, clip boards, etc.) must be logged in at the control point.
- Maintenance work to approved work orders and Inventory each tool, in and out of facilities.



Next

Monitoring and Inspection



Monitoring:

Operations must provide 100% monitoring/surveillance of all maintenance activity in FOD Control Zones.

Inspecting:

At the conclusion of this activity, Operations and/or Quality Assurance will perform a hands-and-knees inspection.

Next

Let's take a little Quiz.

An Open Status is when all FOD, tool, material and access control measures are in force.

- ○ True
- ☑ False

Let's answer some questions.

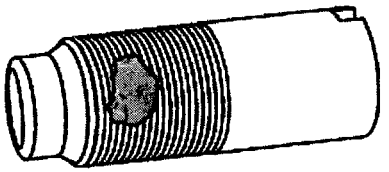
For Maintenance work in a Controlled Status, Operations will provide monitoring/surveillance of all maintenance activity in FOD Control Zones when in a Controlled status, how often?

- ☐ Only on swing shift
- ☑ 100% of the activity
- ☐ Only when maintenance requests it
- ☐ Only on weekends

Submit Reset

Housekeeping Continued

- Personnel are to practice a "clean-as-you-go" policy in all FOD Control Zones to maintain a Visually Clean (VC) level of cleanliness.
- All egress routes must be kept clean.
- Wastes will be removed at earliest opportunity.
- All spills and out-of-place propellant must be cleaned/addressed immediately.
- Floors will be cleaned daily unless building is not in use. During processing operations sweeping will be kept to minimum and as allowed by planning.

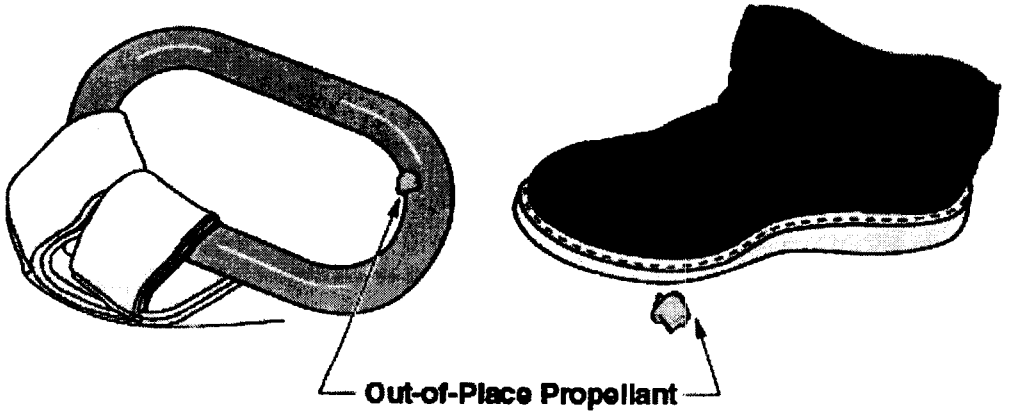


Next

Let's take a quiz.

All spills or out-of-place propellant must be cleaned/addressed within the next 2 working days.

- ○ True
- ✓ False



Let's see what you have learned.

Maintenance personnel are responsible for their tools carried into the controlled production area. These responsibilities include:

- [x] Inventory each tool, in and out
- [x] Work to approved work orders
- [x] Clean as you go
- [x] Use Tool Checklist (FOP-0179)

Submit Reset

What else have you learned?

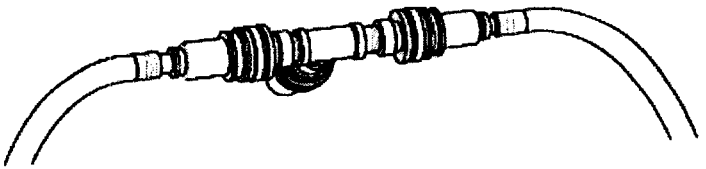
All facilities or processes where energetic materials are processed may have what FOD controls?

- [x] Personnel check-in
- [x] Training qualifications
- [x] FOD Bags
- [ ] Shoe cleaners/tacky mats
- [x] Tethered Tools

Submit Reset

Environmental Monitoring

- RSRM program requires regular monitoring of particulate contamination in the environment and in plant-air systems and nitrogen.
- In the Mix/Cast work center, this monitoring includes the following:
  - LMCP and M-325
  - Compressed Air
  - Operations are to maintain the quality of the compressed air/nitrogen used in FOD Control Zones by keeping outlets, connections and hoses clean and dry.



Next

Environment Monitoring

LMCP and M-325

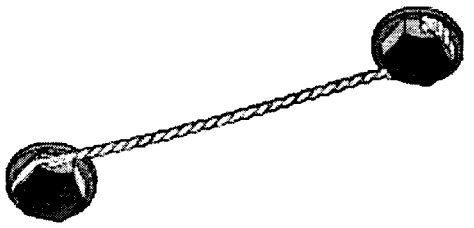
- Particulate levels in the environment are to be measured weekly using portable systems as approved by the Central Contamination Control Team (CCT). Only particle sizes of 5.0 micron and larger will be measured. Obtained data will be controlled through SPC Charting.

Next

Fastener Control

All facility/tooling fasteners in or affecting FOD Control Zones (except adjustment screws) will be positively secured or controlled per planning to provide hardware protection. In FOD Control Zones, all fasteners must be positively secured.

- Approved Methods are:
  - Lock-Wire
  - Safety-Wire
  - Locknut
  - Lock-Tite
  - Staking/Preening



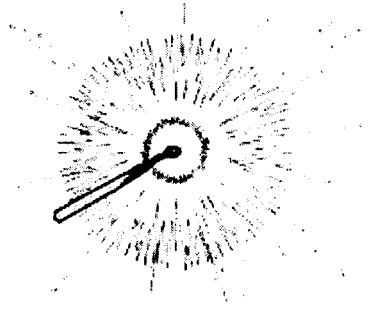
Blind holes will either be filled, or positively identified by applying a cross through the hole in contrasting color ink/paint.

Next

Critical Tooling/Hardware Protection

Critical tooling/hardware must always be protected from exposure to outside air/dust and FOD. Vehicles entering the process building must be equipped with a spark/flame arresting device.

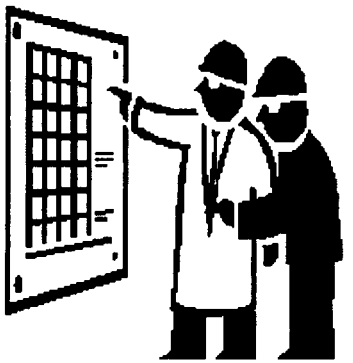
In areas where plastic hanging curtains are used, the individual curtain strips are to be regularly inspected and cleaned of any potential FOD.



Next

Work Center Contamination Control Team (CCT)

The work center CCT is composed of representatives from Engineering and Operations. They meet regularly to communicate, guide, coordinate and assure implementation of FOD objectives as defined by management and established procedures.
This team will track and assure a timely response to actions identified during regular Contamination Control Audits.



Next

Contamination Control Audits

As a minimum, audits shall be performed annually in all facilities containing FOD Control Zones.

Any findings/discrepancies that cannot be corrected on the spot, must be documented in writing and forwarded to the applicable Operations Manager for corrective action.

Findings shall be forwarded to the work center CCT for documentation and charting.

Next

How about another quiz?

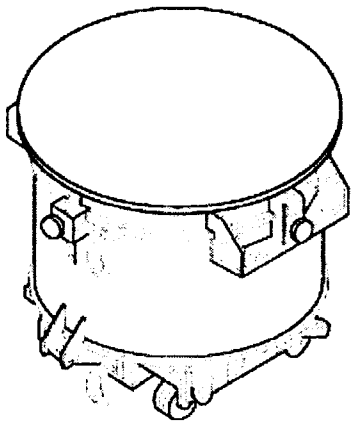
At a minimum, how often will Contamination Control Audits be performed in FOD Control Zones?

- ☐ Weekly
- ☐ Monthly
- ☑ Annually
- ☐ Daily

Submit Reset

Material Containers

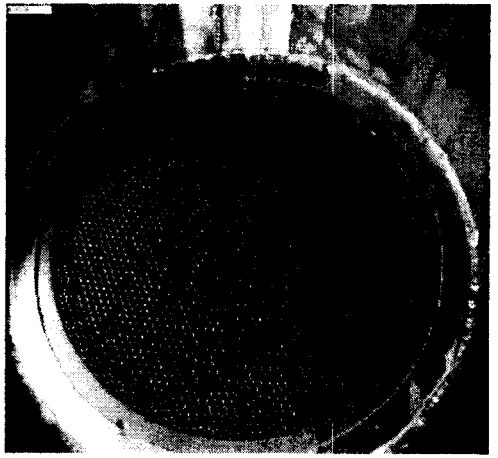
Open bins and mix bowls containing product should not be left unattended (except where remotely processed). Lids or covers should only be removed within the confines of a secure area or station.

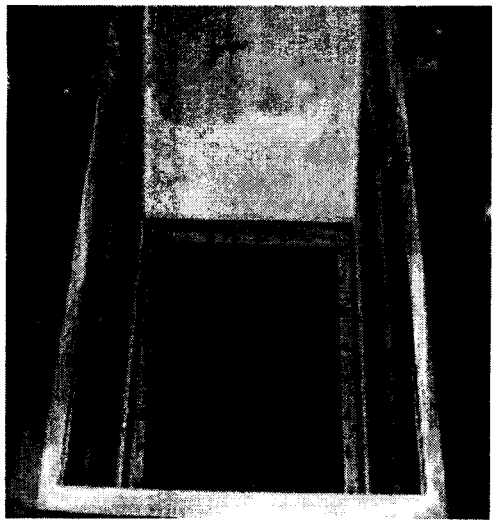


Next

Material Screening

All raw materials added to a mix-bowl or a grinding mill, must be screened before addition.





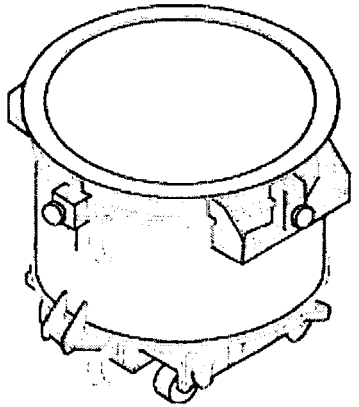
All protective shields and overhead canopies must be used as required.

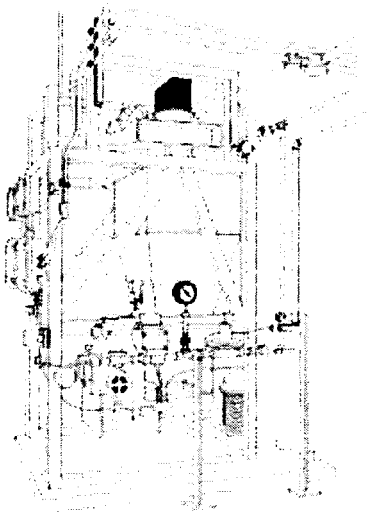
Next

Let's take a little quiz.

All raw materials added to a mix-bowl or a grinding mill, need not be screened before addition.

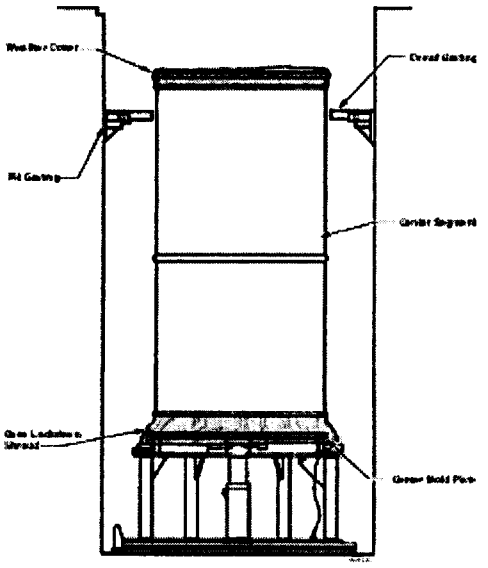
- ○ True
- ☑ False





Large Motor Casting Pit (LMCP) FOD Checklist

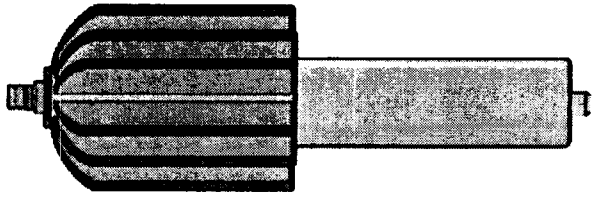
At the LMCP a special "Casting Area Item Checklist" is used to control FOD. This form must be maintained from the time the case is installed in the pit until the pit is covered. A checklist is also required during other critical operations such as Castable Inhibitor application.



Next

Core Processing

Core exteriors must be covered before transporting and during horizontal storage in the LMCP. For RSRM, at Pit-13, before scheduled Teflon coating operations, the core interiors must be vacuumed and stored in the horizontal position with the aft end covered.



Next

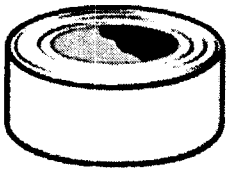
Segment/Motor Protection

- If not being worked at a casting pit, Motor Segment is to be covered.
- For RSRM, the pit lid must be installed if segment is not being worked.

Next

Tape Control

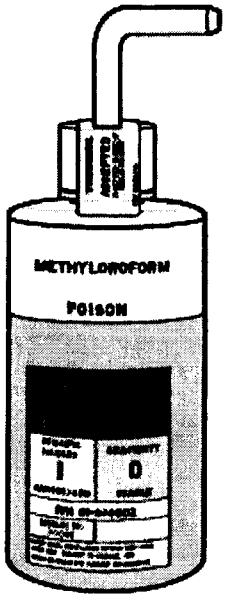
The process of tearing plastic tape easily generates loose FOD. Tape is used only when planning calls for it to be used. Whenever tape is used, great care is required when applying and removing the tape. If tape is used to secure plastic covers, all pieces must be accounted for when removed.



Next

Controlled Materials

- Solvents
  - Refilling of solvent wash bottles by operators will not be allowed.
  - All wash bottles containing Methyl Chloroform will be ordered from supply stores.
  - Bottles of PF degreaser and Ionox BC solvent will be distributed from appropriate bottle fill stations.



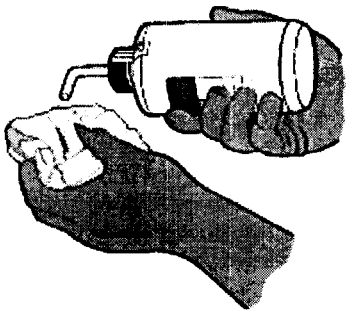
Next

Let's take a quiz.

The following statement are true for Methyl Chloroform, PF degreaser and Ionox BC solvent wash bottles:

- [x] Refilling of bottles by operators is not allowed
- [ ] Dispose of old bottle at bottle fill station
- [x] Pick up new bottle at fill station or supply stores

Submit Reset



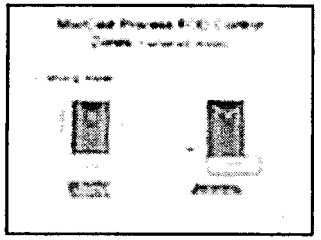
Crane Debris/Drip Shield Exemptions

- The following list of cranes have been waived by the Contamination Control Team for requiring a debris/drip shield:
  - Mixers (M-20, M-22, M-24, M-25) 8 Ton and 4 Ton Cranes
  - M-27 – ½ Ton Jib Crane
  - M-120 – 7.5 Ton, 2 Ton West Bay, 5 Ton east Bay and 5 Ton back up east Bay
  - M-314 – North and South 2 Ton cranes for lifting Iron Oxide bags
  - M-320 – 3 Ton Hoist in battery room

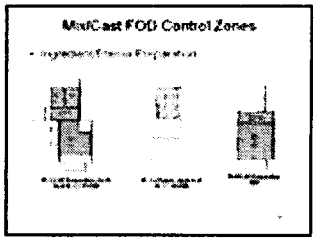
Next

Mix/Cast Process FOD Control Zones (Darkened Areas)

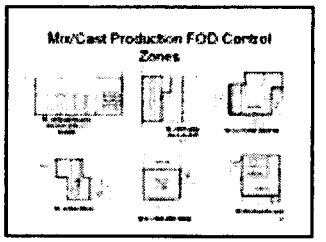
Click on picture for more details, then click the back arrow to return to this page.



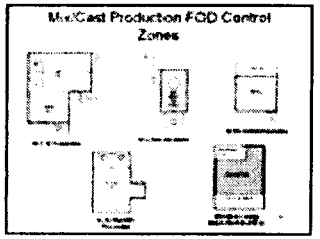
Mixing Areas



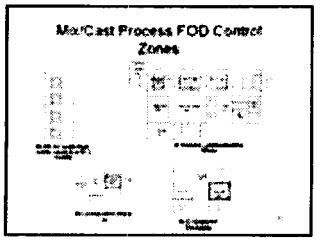
Ingredient/Premix Preparation



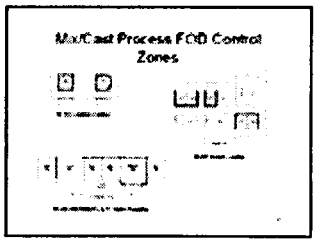
Production



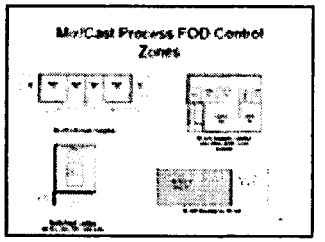
Production



Process



Process

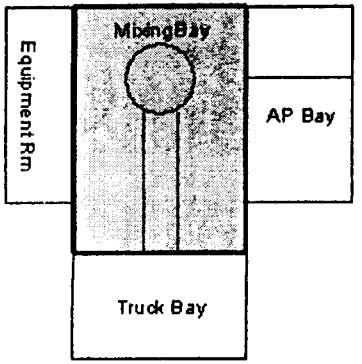


Process

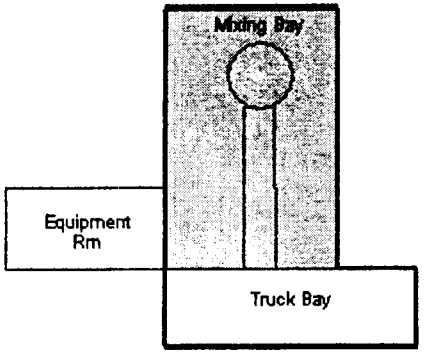
Next

Mix/Cast Process FOD Control Zones (Darkened Areas)

- Mixing Areas:



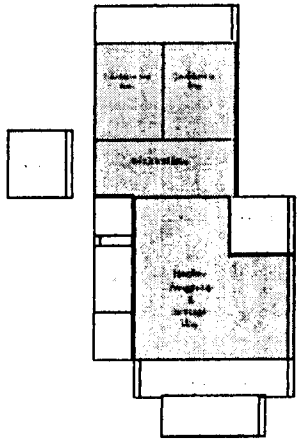
South Plant Mixers (M-20, 22, 24, 25 – Check-in at M-26)



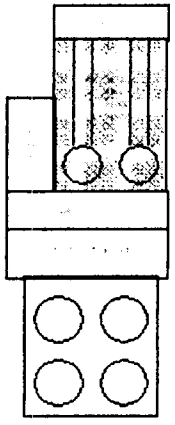
North Plant Mixers (M-519, 521, 523, 526)

Mix/Cast FOD Control Zones

- Ingredient/Premix Preparation

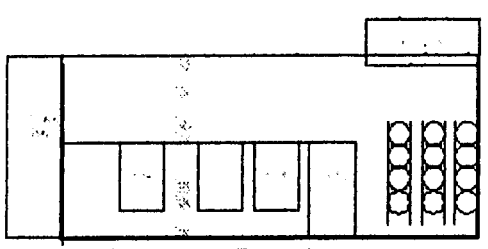


M-174 AP Preparation check-in at M-171 (RSRM)

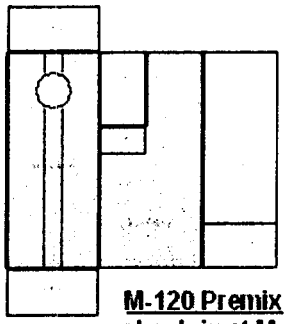


M-314 Premix check-in at M-171 (RSRM)

Mix/Cast Production FOD Control Zones

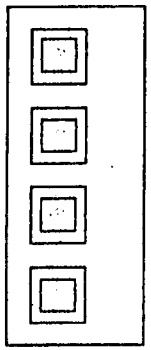


M-320 Bowl Recycle check-in at M-171 (RSRM)

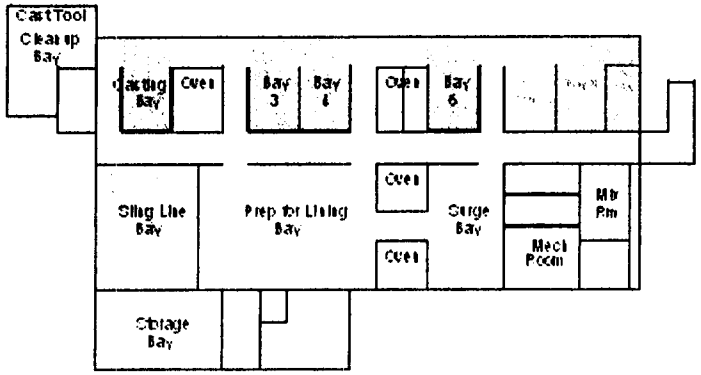


M-120 Premix check-in at M-171

Mix/Cast Process FOD Control Zones

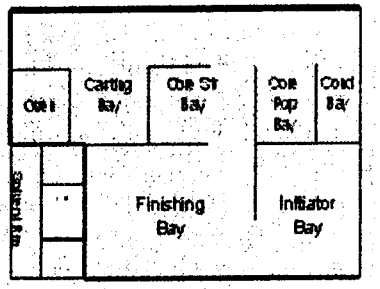


M-300/301 South Plant Casting check-in at M-32 (RSRM)

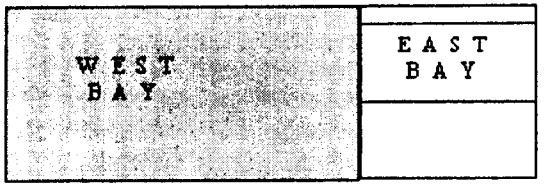


M-16 Igniter Casting/Inhibitor Mixing

Mix/Cast Process FOD Control Zones

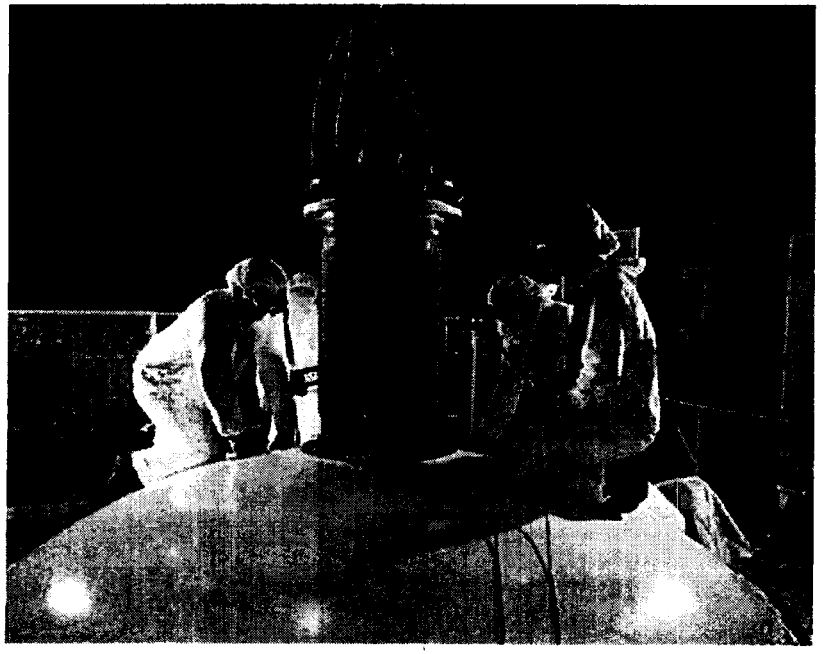


M-325 Sample Casting checking at M-325A (RSRM)



M-309 Backup for M-320

Contamination Control Awareness



Completion of this training is required for general access to most ATK Thiokol work centers.

Qualification does not grant access to any of the controlled processes within any work center. If access is needed to these contamination controlled areas, additional work center specific contamination control training (and others as required) must be completed.

Average completion time = 25 min. *make sure you charge to the proper number*

Next

Why more training?

This training will provide basic contamination control knowledge and encouragement to help the individual take the appropriate steps to protect the facilities, the hardware, and themselves.

The goal of this training is:

Improve the quality, reliability, and safety of our products and work areas by providing you with the ability to recognize contamination and knowledge of control measures to prevent the introduction of contaminants into our processes.

What is in this course for me?

After completing this training, you will be able to:

Describe what contaminants are.

State the impacts contaminants can have on our products.

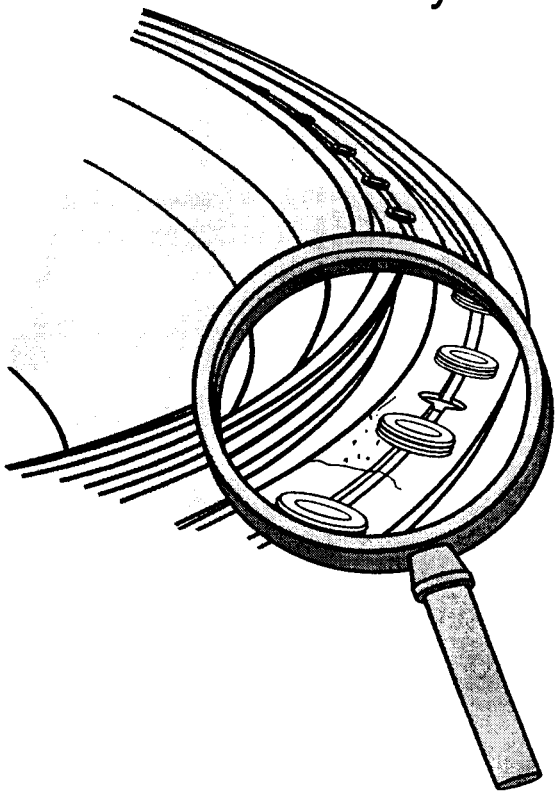
Identify the various forms of contamination and give examples of their sources.

List methods to control contamination and give examples of their application.

Recognize building access restrictions.

What is Contamination?

Contamination is any unwanted substance within a particular environment.



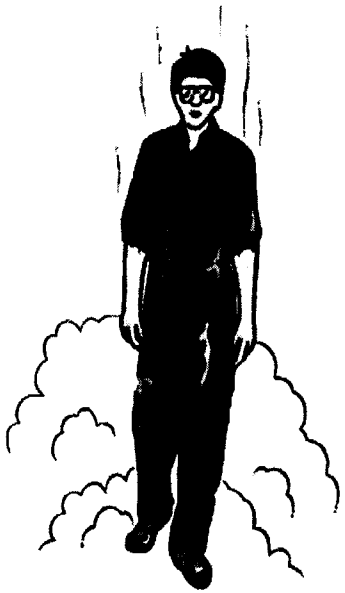
As often is the case, a material necessary in one process might be a contaminant in another.

The key to the definition of contamination is that the substance is **unwanted** in a particular environment.

Let's review how contaminants can affect our products.

States of Contamination

Contamination has a vast number of forms and is found almost everywhere. Contaminants come in every state of matter: solids, liquids, and gasses.



You may be surprised to learn that **people** are the most common source of contamination.

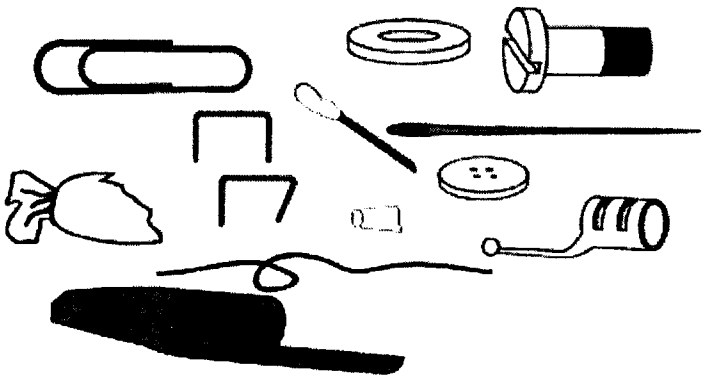
We shed skin, hair, perspiration, and spread oral and nasal fluids. Plus we are carriers; the clothing we wear has loose threads, fibers, lint, numerous particulates and contaminants. We tend to spread these unwanted materials everywhere we go.

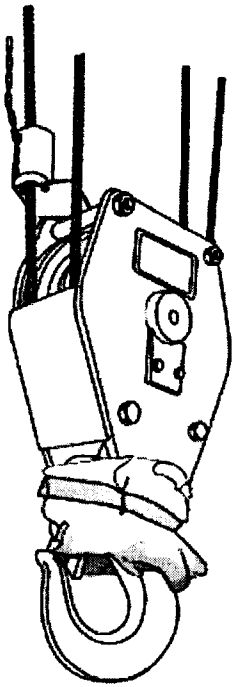
Solids

As shown on the previous page, Solids contamination are materials brought inadvertently into a process. These people-particulates may be skin scale, hairs, dust, lint, fibers, and ash from cigarettes.

But people are not the only sources of contamination we are concerned with ... Process Particulates are particles from adjacent manufacturing activities or maintenance work. These may include: smoke, weld spatter and fumes, machining chips and burrs, materials shedding, and debris from overhead cranes.

Particles of significant size are grouped loosely under the name of FOD, Foreign Objects and Debris. Similar items to those in the picture have been found in or near critical bonding and assembly areas.



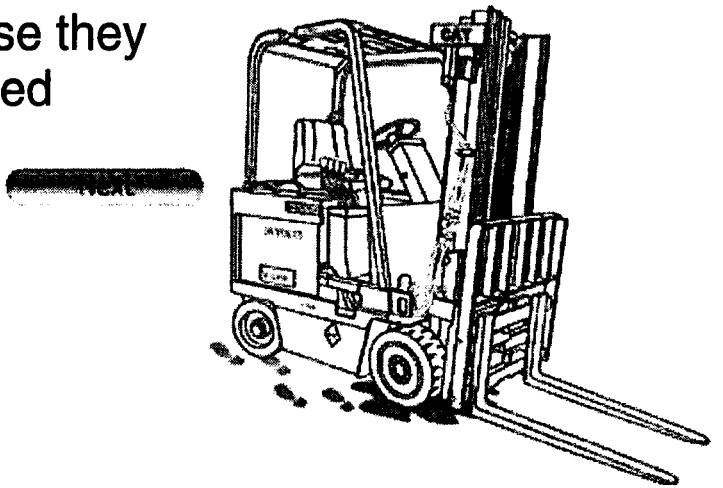


Liquid Contamination

A liquid in the wrong place can be a contaminant. Common sources are people perspiration, water, solvents, oils, lubricants, and humidity.

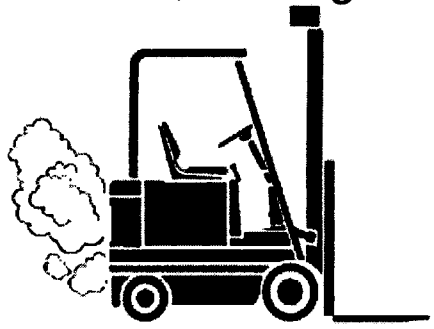
Water and other liquids may cause corrosion, electrical shorts, and unbonds.

Liquids and semi-solids are difficult to control because they are often hard to see and so easily spread and tracked through the workplace.



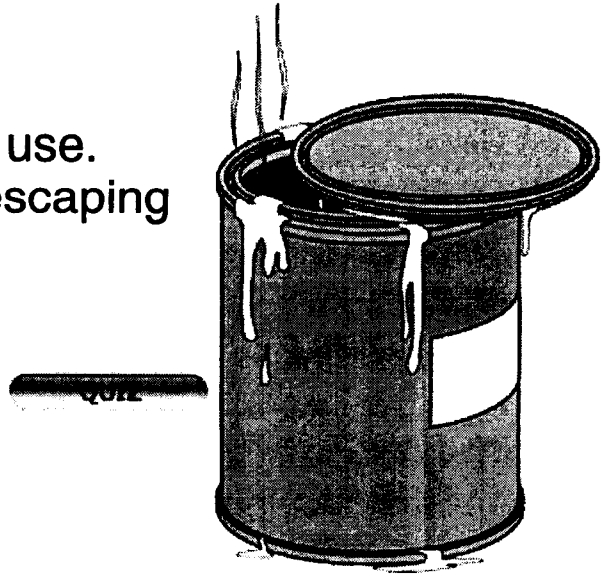
Gaseous Contaminants

Gaseous contaminants are suspended in the air and can condense on critical surfaces. Gaseous contamination can come from workteam members, chemical vapors, and combustion exhaust gases. Gaseous contamination can be visible or invisible, making it difficult to identify and control.

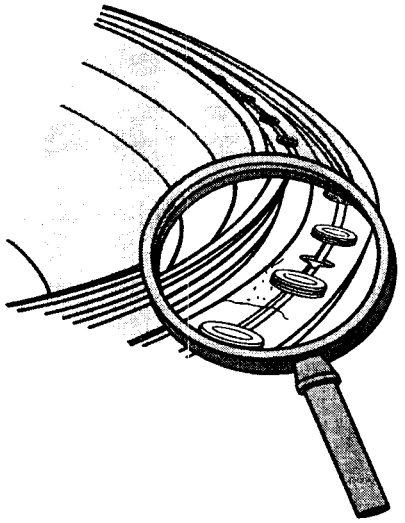


Only electric-powered forklifts and manlifts are permitted inside critical bonding areas.

Paint and solvent cans must be tightly closed when not in use. Spills must be cleaned up immediately to prevent fumes escaping and the spread of liquids.



Let's have a quick review of what we learned.



Contamination is:

- ☐ OK because there is so much of it everywhere.
- ☑ Stuff where it shouldn't be.
- ☐ Not a big deal in our business.
- ☐ Only a concern if it is a solid FOD.

Reset

People are: (Select all that may apply)

- ☐ Sources of many types of contaminants.
- ☑ Carriers of contaminants.
- ☐ Not very good at seeing most contaminants.

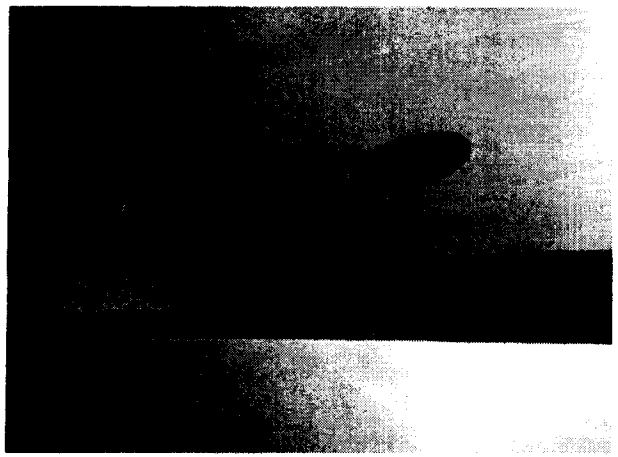
Submit Reset

Some of the reasons we do not see many contaminants are:

(Select all that may apply)

- [ ] They are very small particles on the part's surface.
- [ ] They are very small and suspended in the air.
- [ ] They are introduced at the vendor's plant and we assume the parts are clean.
- [x] The planning says the parts should be clean, so we just don't look as hard.

Submit Reset



Controls of Contamination

In the previous section of this training, we learned how contamination affects both the quality and safety of our products. We were shown how contamination is almost everywhere and comes in numerous forms. This next section of this course will focus on controlling the unwanted substances.

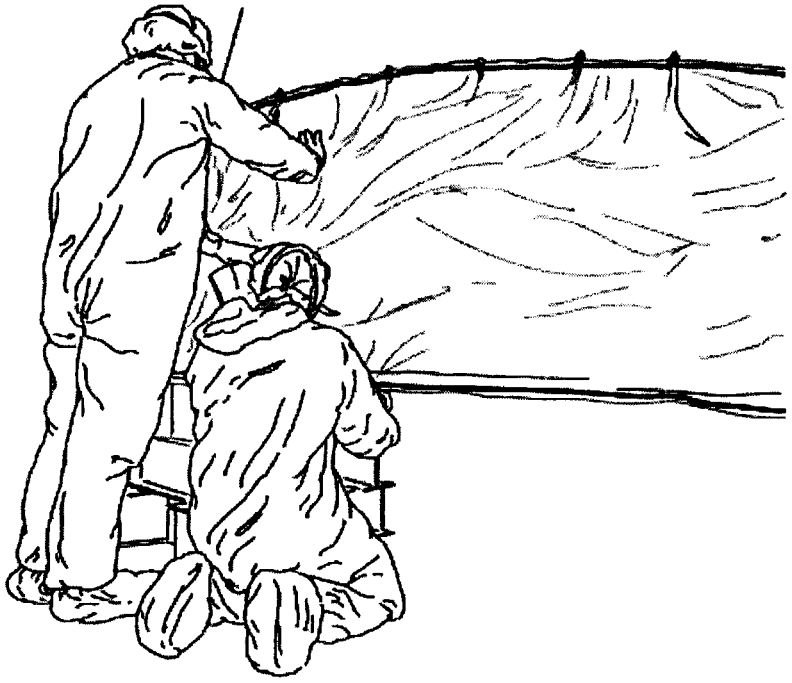
We must make sure all tooling and components used to manufacture the hardware are clean and free of contamination. The best place to begin control is **outside** of the controlled bonding or assembly areas.

These Foreign Object Control areas are identified by signs on doors, barricaded work bays, and are protected with cleansing equipment. Before people, equipment, materials, and even the air are allowed into controlled bonding or assembly areas, each must be made clean.

Let's begin by protecting the parts from the people.

Critical Process Controls

During bonding and assembly operations, contamination from operators is controlled through strict entry procedures and apparel. All critical processes must be performed in a controlled area and only essential work team members allowed to enter the area.



Before entering rocket motor segments, operators must wear the appropriate low-lint clothing to limit contamination generated by themselves. Since the special clothing covers most of the body, it acts as a filter keeping particles that shed from getting into the air and into the part.

Operators and transients in the Mix/Cast facilities cannot wear clothing with buttons. Pullover tee-shirts will prevent loose buttons from entering into the hardware or tooling.

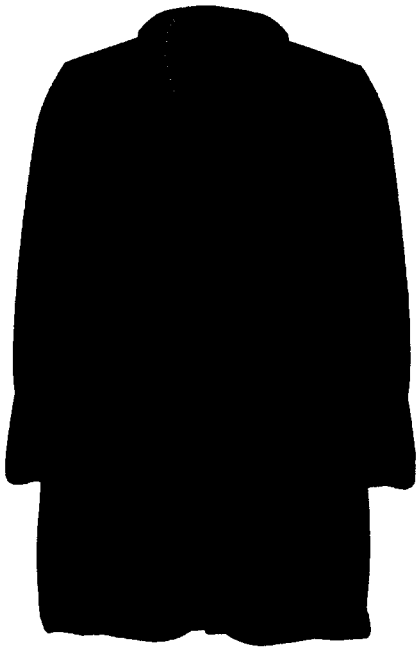
After bonding operations, the low-lint clothing is removed and disposed of to prevent contamination collected from the bonding operation from entering into other work areas.

Hair Nets

Hair and beard nets must be worn in all Foreign Object Control bonding areas. You must make certain all of your hair is covered. When wearing a hat with a bill, it must be entirely covered with a hair net. Be aware that hats are not permitted in some areas. Always check planning to see if hair and beard nets are required for the job you are performing.

Clothing

Change your clothing regularly. If coveralls, coats, or smocks are soiled or worn until they have gross contamination or loose threads, then you may be unknowingly spreading particulates and other types of contamination everywhere you go. Turn them in at the change area and pick up clean ones. Do not take work clothing home to wash because you may unknowingly spread industrial contamination into your home or likewise transfer contaminants back to your job (fabric softeners, etc.).



Wear gloves called out by planning. When you are using disposable gloves, change them often to prevent touching hardware with soiled gloves.

Leather gloves are both long lasting and, unfortunately, absorbent. These gloves easily absorb grease and liquids and transfer them to everything they touch. Take care not to contaminate bonding surfaces.

Empty Pockets & Empty Hands

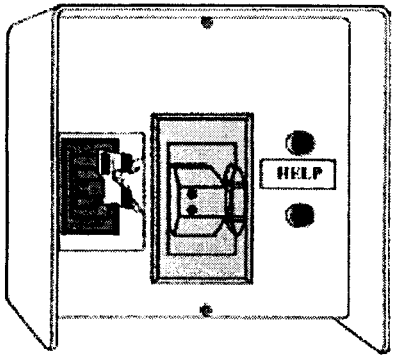
The "Empty Pockets" policy is in force at all mixer buildings and in Foreign Object Control bonding areas. All personnel entering a FOD sensitive area shall empty their pockets before entering.

Jewelry of any kind, (exceptions on Medical alert bracelets and necklaces.) Painted or false fingernails or other similar items that could chip or break and fall unnoticed into the processes are NOT allowed.

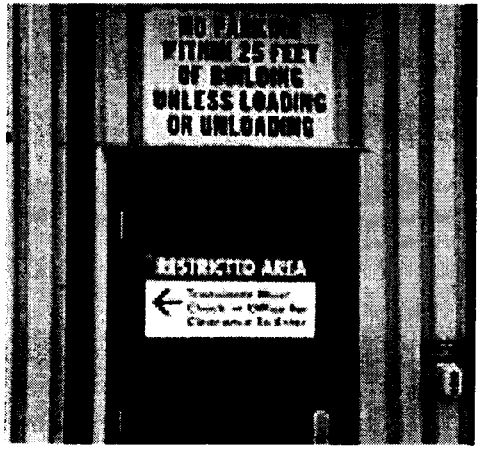
Please check in with area supervision to make certain you are in compliance with area procedures.

Controlling Access

All operators and transients or observers must enter through the controlled-area entry points. Some facilities have badge activated door locks. These doors must be securely closed after opening.



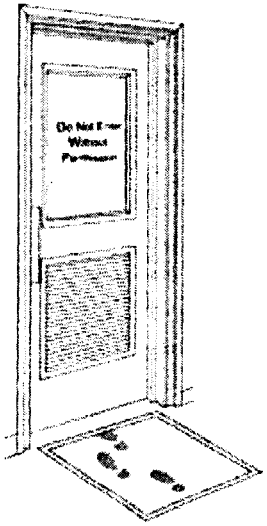
Other areas have check-in requirements where transients and observers are screened for clearance to the manufacturing areas.



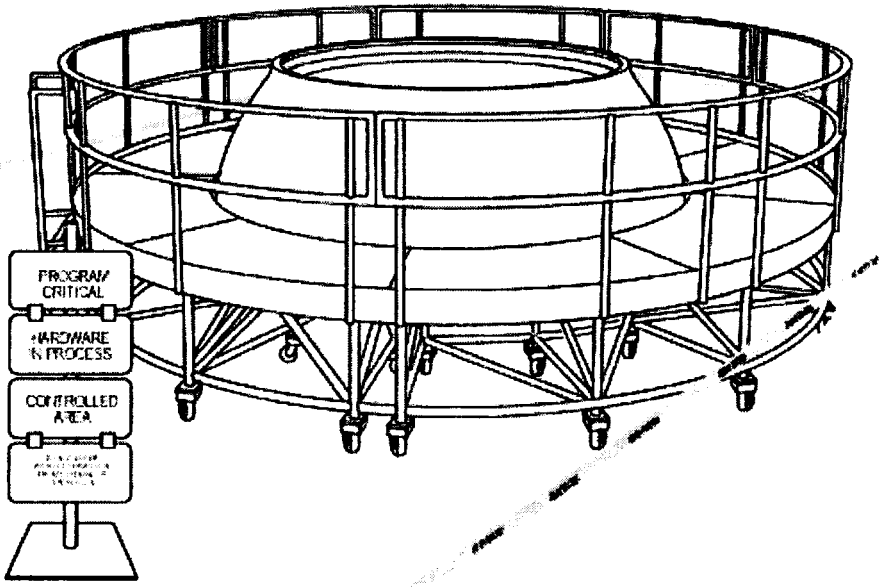
Typically these areas do not allow food, tobacco, or gum and an Empty Pockets rule applies.

Isolating Operations

Operations using materials for production work that are potential contaminants to other operations must be isolated or cordoned off.



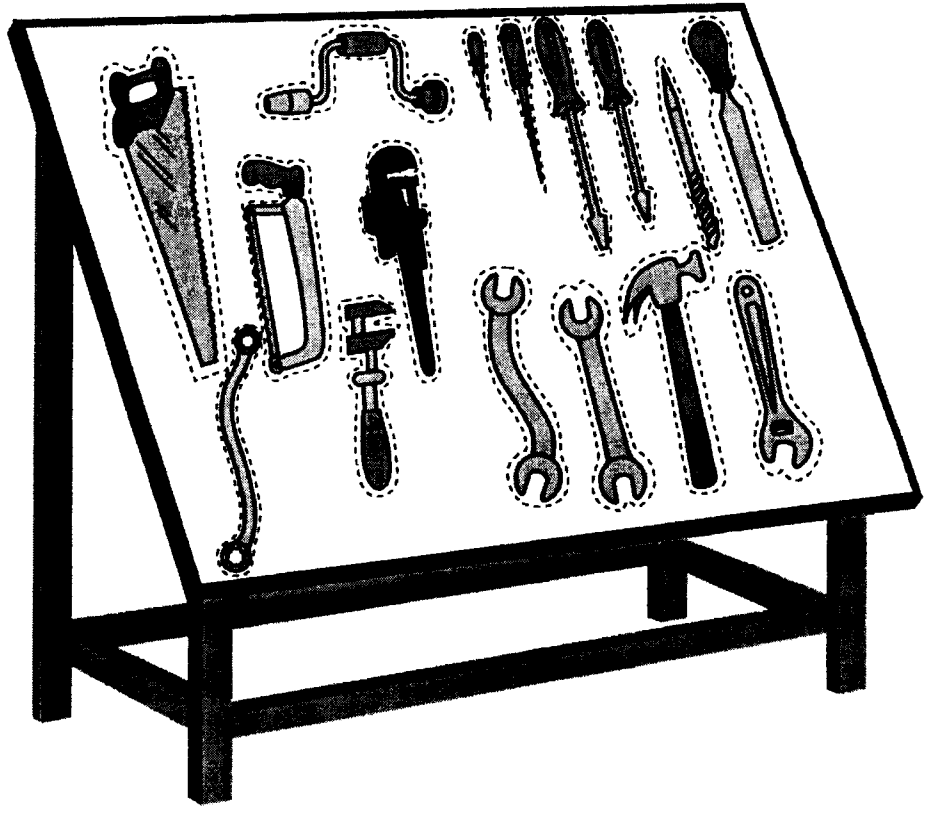
The placement of tacky mats or shoe cleaners at the entrance to Foreign Object Control bonding and assembly areas is recommended. Tacky mats should be changed regularly to avoid being overloaded with dirt; this is everyone's responsibility.



Control Hand Tools

Use shadow boards to store tools and account for tools when they are not in use.

- Never leave hand tools in an area where they could slip or fall into open processes.
- Always clean hand tools before returning them to storage.
- A station checklist must be maintained to account for all items entering and leaving the areas. The checklist will help assure all items entering the Foreign Object Control area are accounted for at all times. If any item is not accounted for, shut down and find it.

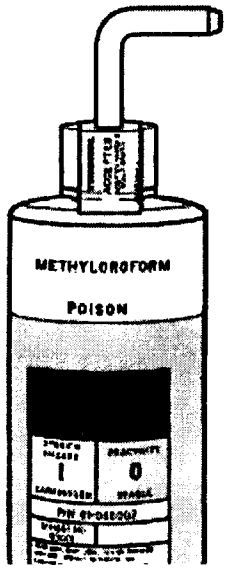


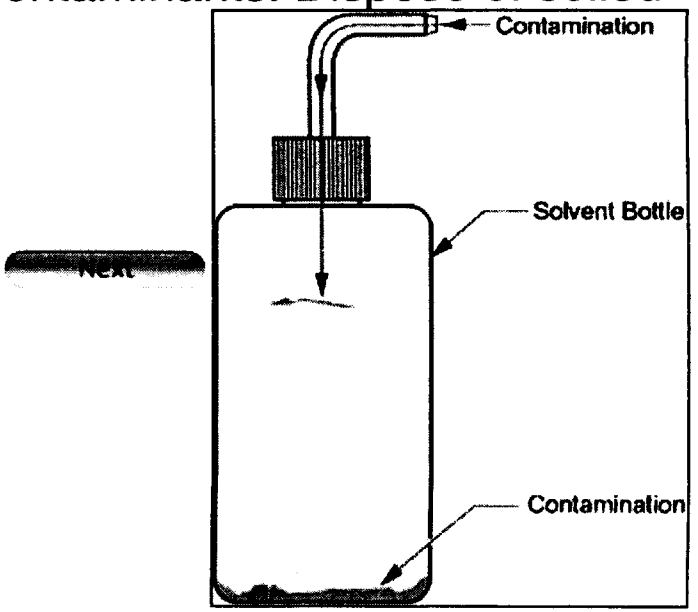
Until a lost item is found, it is considered to be in the component or segment.

Squeeze Bottles

A solvent bottle can easily spread contamination if not properly used.

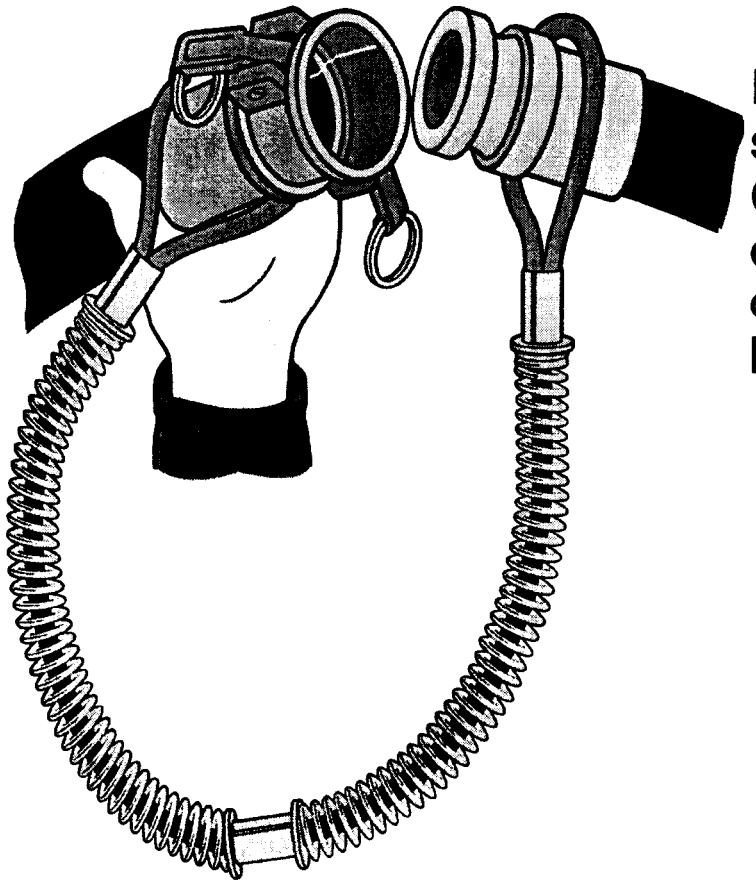
- When dispensing solvent from wash bottle to a wiping cloth, leave a gap between the dispensing nozzle and the cloth. Never enclose the tip of solvent bottle in the wiping cloth. Solvent can be siphoned from cloth when releasing hand pressure on the bottle and then carry contaminants back into the solvent bottle. Should this happen, attach a "Use Prohibited" Tag and properly dispose of contaminated squeeze bottles to prevent cross-contamination.
- When hand cleaning with solvents, change the cleaning cloths frequently to prevent the cloths from becoming saturated with contaminants. Dispose of soiled cloths in an approved container.





Air Lines: Controlling Contamination

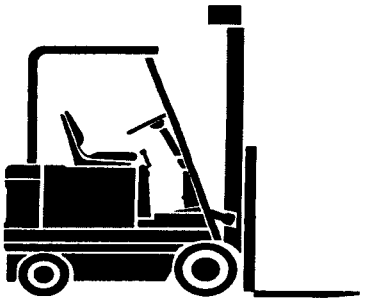
Inspect outlets on compressed air system for any contamination in or around outlets before using. If an outlet appears to have moisture or any other type of contamination, stop use immediately, place a "Use Prohibited" tag on the outlet, then notify the building supervision.

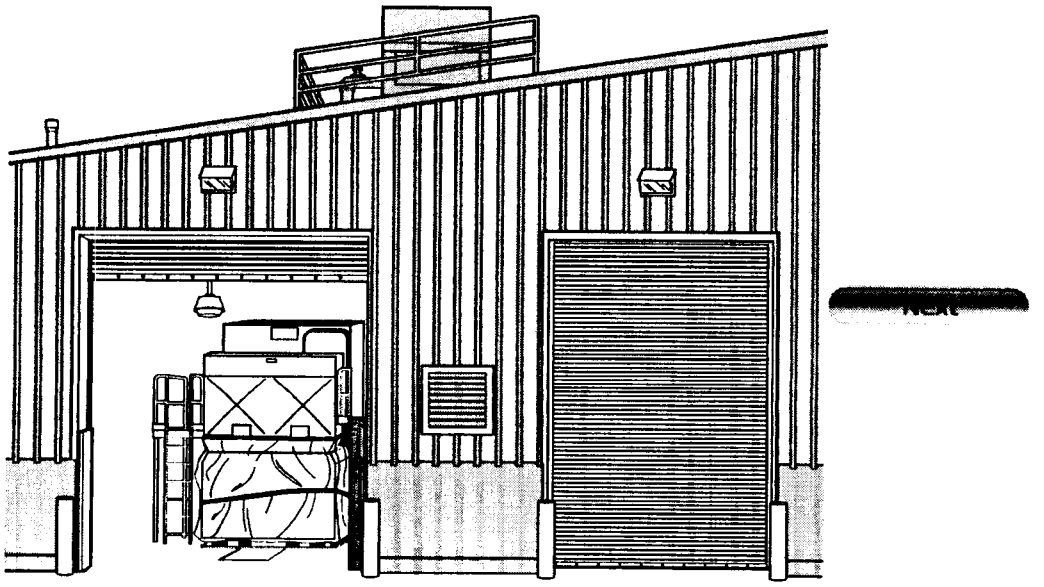


For RSRM facilities, testing of the compressed air system will be accomplished by the Contamination Control Laboratory (M-35A lab) using the compressed air sampling plan. The air is continuously monitored for moisture and hydrocarbons.

Roll-up Doors

Roll-up doors in FOD Control Zone bonding areas help control migration of contamination from outside the area. The only time they should be open is when tooling, equipment or materials are moved in and out of the building.





Release Agents

A release agent is any substance preventing or inhibiting bonding. Release agents are used in work centers to intentionally prevent bonding. Teflon® tape, for example, is used to prevent rubber or test material from bonding to tooling. RTV (silicone) is used on the forward core to prevent propellant from penetrating mating surfaces.

A release agent on a bonding surface will cause an unbond by reducing the strength of the bond.

Several substances are considered release agents: Silicones, hydrocarbons, fluorocarbons, body oils, Teflon®, grease, lubricants, and other materials used in our work centers. Use only those materials called out in the shop planning.

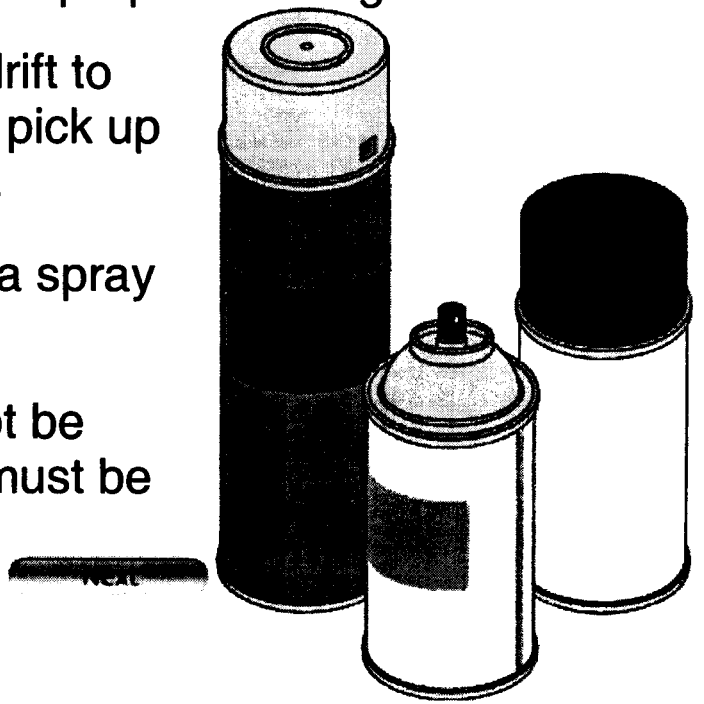
Aerosols

Always be wary of using aerosols in a controlled facility. The material in the can as well as the propellants are almost always detrimental to proper bonding.

The mist from spray cans is easily airborne and can drift to critical components. The air conditioning system can pick up and move these particles throughout an entire facility.

Equipment requiring spraying should be isolated into a spray booth or outside and away from building airducts.

When spray must be applied to equipment that cannot be removed or isolated, critical components in the area must be covered.

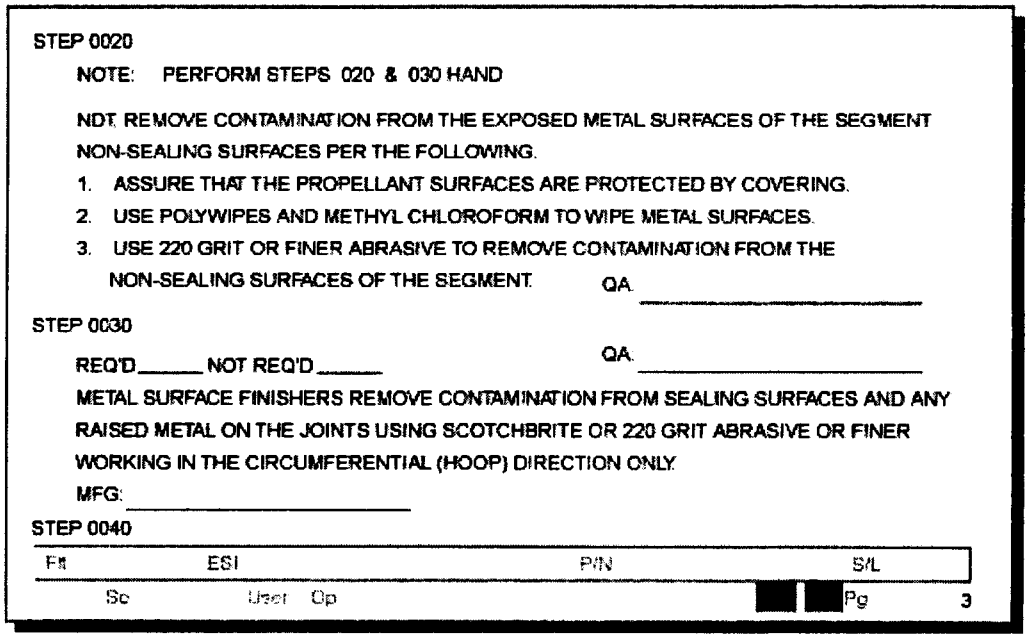


Follow the Procedures -

Documents showing how an organization deals with contamination control must be followed.

Shop planning will also alert you to other specific procedures concerned with contamination.

Do not hesitate to stop what you are doing to ask for directions and clarification.



STEP 0020

NOTE: PERFORM STEPS 020 & 030 HAND

NDT REMOVE CONTAMINATION FROM THE EXPOSED METAL SURFACES OF THE SEGMENT NON-SEALING SURFACES PER THE FOLLOWING.

1. ASSURE THAT THE PROPELLANT SURFACES ARE PROTECTED BY COVERING.
2. USE POLYWIPES AND METHYL CHLOROFORM TO WIPE METAL SURFACES.
3. USE 220 GRIT OR FINER ABRASIVE TO REMOVE CONTAMINATION FROM THE NON-SEALING SURFACES OF THE SEGMENT. QA _____

STEP 0030

REQ'D_____ NOT REQ'D_____ QA _____

METAL SURFACE FINISHERS REMOVE CONTAMINATION FROM SEALING SURFACES AND ANY RAISED METAL ON THE JOINTS USING SCOTCHBRITE OR 220 GRIT ABRASIVE OR FINER WORKING IN THE CIRCUMFERENTIAL (HOOP) DIRECTION ONLY.

MFG: _____

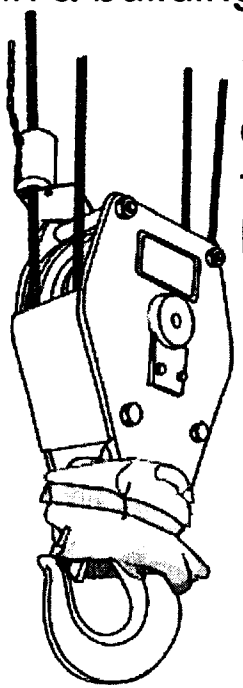
STEP 0040

Fit ESI P/N S/L

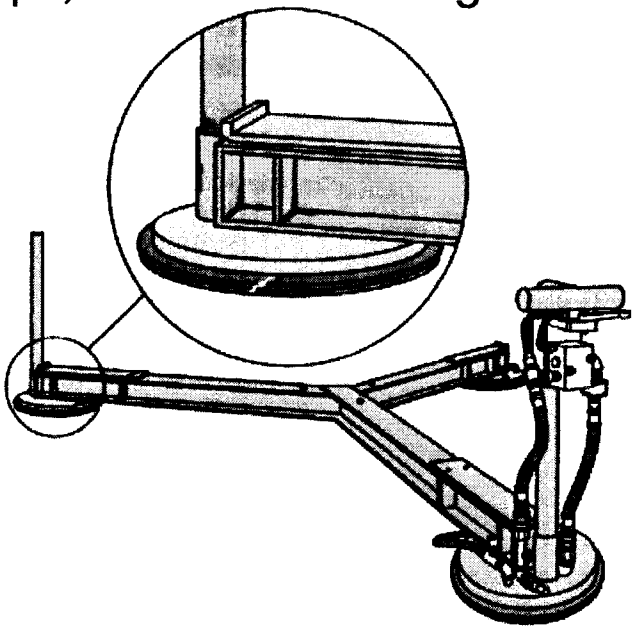
Sc User Op Pg 3

Sources of Contamination

It has been pointed out that contamination can come from many different sources. The tooling can become rusty, have cracked paint or chips, and metal shavings. Facilities may not have clean surfaces, aging painted walls, and cracked floors. Tools and normal operations in a building are also sources of particles.



Machinery such as forklifts, manlifts, overhead cranes, and hand tools contribute to the contaminated work environment with leaks, exhaust gases and wear.



Clean As You Go

Clean potential contamination as you are working. Don't leave it for the end of your shift when you may be in a hurry to finish up a job. And never leave your mess for the next crew.

The QUIZ button below will take you to the next series of questions and a TEDS link.

The person in the picture

- ☐ is proud of his work, and shows it.
- ☐ is appropriately dressed for a critical bonding job.
- ☑ should seriously consider a visit to the Laundry.
- ☐ needs to take his overalls home for a good washing.

Reset

The dark spots on the rubber pattern are plastic flakes from the worn-out shelf cover.

A solution could be:

- ☐ Use high pressure compressed air to blast away the pieces of debris.
- ☐ Grab a shop rag and wipe out the particles.
- ☑ Remove the rubber for cleaning. Do not ignore the problem. Consider replacing the shelf cover or finding a cleaner long term solution.
- ☐ Use sticky tape to remove the debris.

Reset

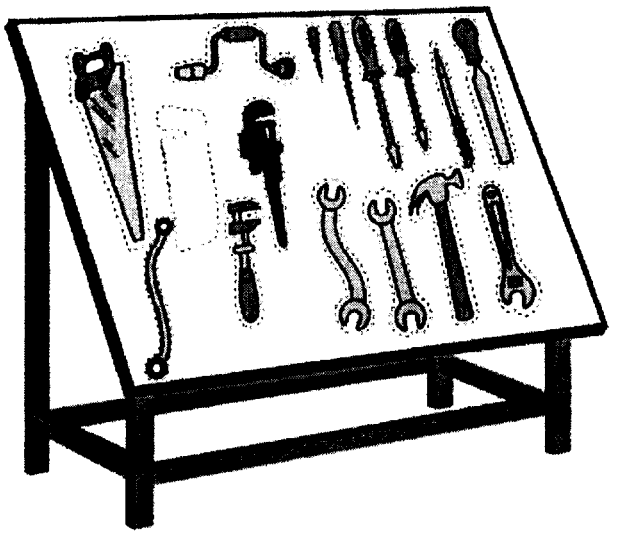
This sign means:

- [x] If you don't work in here, please check in.
- [ ] Better find another way in.
- [ ] Wait for a friend to let you in.

Reset

Which operator is wearing a hair net correctly?

Click on the correct picture.

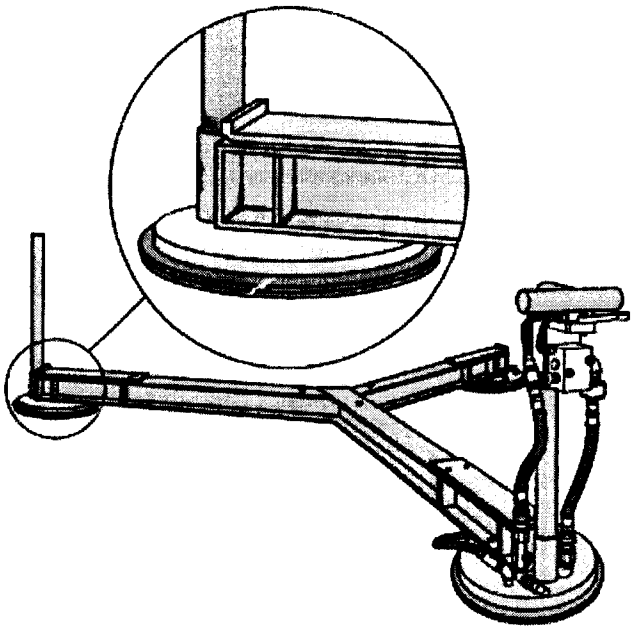


The job is done and the truck is ready to take the hardware to the next facility for Final Assembly.

- ☐ Good to go.
- ☐ Just empty the trash and I am done.
- ☐ Bob must have taken that hacksaw with him.
- ☐ Nobody and nothing leaves until we find that saw!

Reset

The air bearing has some loose rust and paint chips, it needs a little touch up.



- ☐ In between jobs, use a wire brush on the rust.
- ☐ Go to the Crib for an aerosol can of paint and spray.
- ☑ Have the bearing removed for maintenance and preservation. Also, contact supervision to assure rust has been contained and has not contaminated product or process.
- ☐ Just cover up the rust with tape.

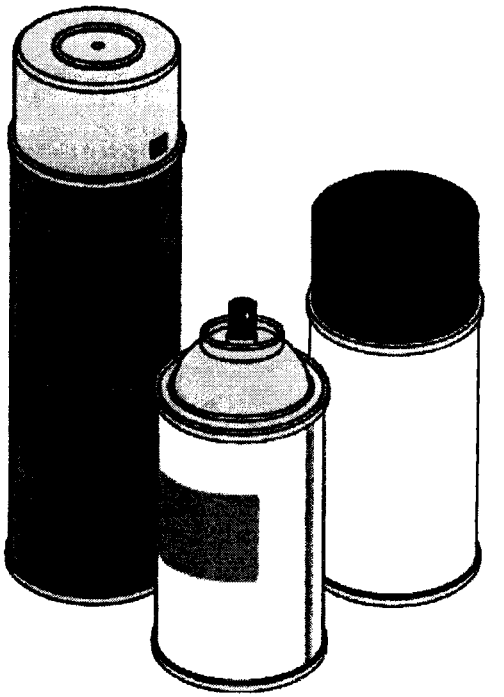
Reset

The problem with aerosol cans in bonding and assembly areas is:

(Select all that may apply)

- ☑ The spray consists of fine particles.
- ☑ The aerosol propellant can be as bad as the paint.
- ☑ If not controlled, spray particles can drift onto nearby critical parts.
- ☑ Air moving systems also move these fine particles into undesired areas.

Submit Reset



Ways we control contamination in bonding and assembly areas are: (select all that may apply)

- ☑ Controlling aerosols.
- ☑ Monitoring compressed air lines.
- ☑ Restricting access to critical areas to those persons qualified and wearing the proper clothing.
- ☑ Using airlocks, tacky mats, shoe scrubbers and cleaners.

Submit Reset